Amendments to the Claims

Claim 1 (Previously presented): A method for controlling a controlled operation by determining a lag in measured data from at least one actual variable signal, comprising:

processing the measured data using time-series analysis with a filter to produce filtered data with reduced noise content;

arranging the filtered data in matrices with one column for each measured variable signal;

shifting the columns of the matrices to produce a plurality of different shifted matrices, each shifted matrix having a given value for the lag in data for each measured variable signal;

processing each shifted matrix with a variable signal estimator to output a variable signal function for each measured variable signal that defines each measured variable signal in terms of its mathematical dependencies on all of the variable signals;

processing each measured variable signal function with a criterial function to provide an optimal lag value for each measured variable signal;

processing each shifted matrix with a point calculation algorithm to produce a point for each column in each shifted matrix;

processing each point and each optimal lag value with a lag estimator to output a lag function for each lag, each lag function defining each lag in terms of its mathematical dependency on all of the measured variable signals;

determining the goodness of fit of each lag function based on the most recent filtered data by measuring any goodness of fit characteristic;

storing at least one lag function based on its goodness of fit; and

discarding at least one lag function based on its goodness of fit.

Claim 2 (Original): The method of claim 1, wherein the filter is a 1-D filter.

Claim 3 (Original): The method of claim 2, wherein the filter is a time series approximator.

Claim 4 (Original): The method of claim 1, wherein the filter is an n-D filter.

Claim 5 (Original): The method of claim 1, wherein the variable signal estimator is selected from the group consisting of: topological-algebraic infinite-dimensional methods, clustering algorithms, self-organized map (SOM) algorithms, expectation-maximization (EM) algorithms, genetic algorithms (GA), maximum likelihood training of hidden Markov model (MLTHMM) algorithms, neural networks, linear correlation and regression algorithms, nonlinear correlation and regression algorithms, factor analysis (FA) algorithms, and real-time computation of time-recursive discrete sinusoidal transforms (DST) algorithms.

Claim 6 (Original): The method of claim 1, wherein the criterial function utilizes optimization methods to provide an optimal lag value for each variable signal.

Claim 7 (Original): The method of claim 1, wherein the point calculation algorithm averages the values of each column in a given matrix to produce a point for each column in each shifted matrix.

Claim 8 (Original): The method of claim 1, wherein the lag estimator is selected from the group consisting of: topological-algebraic infinite-dimensional methods, clustering algorithms, self-organized map (SOM) algorithms, expectation-maximization (EM) algorithms, genetic algorithms (GA), maximum likelihood training of hidden Markov model (MLTHMM) algorithms, neural networks, linear correlation and regression algorithms, nonlinear correlation and regression algorithms, factor analysis (FA) algorithms, and real-time computation of time-recursive discrete sinusoidal transforms (DST) algorithms.

Claim 9 (Previously presented): A method for controlling a controlled operation by determining a lag in measured data from at least one measured variable signal, comprising:

arranging the data in matrices with one column for each measured variable signal;

shifting the columns of the matrices to produce a plurality of different shifted matrices, each shifted matrix having a given value for the lag in data for each measured variable signal;

processing each shifted matrix with a variable signal estimator to output a variable signal function for each variable signal that defines each variable signal in terms of its mathematical dependencies on all of the variable signals; and

processing each variable signal function with a criterial function to provide an optimal lag value for each variable signal.

Claim 10 (Original): The method of claim 9, wherein the variable signal estimator is selected from the group consisting of: topological-algebraic infinite-dimensional methods, clustering algorithms, self-organized map (SOM) algorithms, expectation-maximization (EM) algorithms, genetic algorithms (GA), maximum likelihood training of hidden Markov model (MLTHMM) algorithms, neural networks, linear correlation and regression algorithms, nonlinear correlation and regression algorithms, factor analysis (FA) algorithms, and real-time computation of time-recursive discrete sinusoidal transforms (DST) algorithms.

Claim 11 (Previously presented): The method of claim 9, wherein the criterial function utilizes optimization methods to provide an optimal lag value for each measured variable signal.

Claim 12 (Previously presented): A method for controlling a controlled operation by determining the lag in measured data from at least one variable signal, comprising:

arranging the data in matrices with one column for each measured variable signal wherein a given stream of values of K process variables is arranged in columns, a snapshot of end time scans is taken resulting in an end by K matrix;

shifting the columns of the matrices by a predetermined value to produce a plurality of different shifted matrices, each shifted matrix having a given value for the lag in data for each measured variable signal;

processing each shifted matrix with a variable signal estimator to output a variable signal function for each variable signal that defines each measured variable signal in terms of its mathematical dependencies on all of the measured variable signals;

processing each measured variable signal function with a criterial function to provide an optimal lag value for each variable signal;

processing each shifted matrix with a point calculation algorithm to produce a point for each column in each shifted matrix; and

processing each point and each optimal lag value with a lag estimator to output a lag function for each lag, each lag function defining each lag in terms of its mathematical dependency on all of the variable signals.

Claim 13 (Original): The method of claim 12, wherein the variable signal estimator is selected from the group consisting of: topological-algebraic infinite-dimensional methods, clustering algorithms, self-organized map (SOM) algorithms, expectation-maximization (EM) algorithms, genetic algorithms (GA), maximum likelihood training of hidden Markov model (MLTHMM) algorithms, neural networks, linear correlation and regression algorithms, nonlinear correlation and regression algorithms, factor analysis (FA) algorithms, and real-time computation of time-recursive discrete sinusoidal transforms (DST) algorithms.

Claim 14 (Previously presented): The method of claim 12, wherein the criterial function utilizes optimization methods to provide an optimal lag value for each measured variable signal.

Claim 15 (Original): The method of claim 12, wherein the point calculation algorithm averages the values of each column in a given matrix to produce a point for each column in each shifted matrix.

Claim 16 (Original): The method of claim 12, wherein the lag estimator is selected from the group consisting of: topological-algebraic infinite-dimensional methods, clustering algorithms, self-organized map (SOM) algorithms, expectation-maximization (EM) algorithms, genetic algorithms (GA), maximum likelihood training of hidden Markov model (MLTHMM) algorithms, neural networks, linear correlation and regression algorithms, nonlinear correlation and regression algorithms, factor analysis (FA) algorithms, and real-time computation of time-recursive discrete sinusoidal transforms (DST) algorithms.

Claim 17 (Previously presented): A method for determining a lag in measured data from a measured variable signal, comprising:

filtering the measured data;

arranging the measured data into matrices, including one column for each measured variable signal;

producing a plurality of shifted matrices with a value for the lag data for each measured variable signal;

processing each shifted matrix to output a variable signal function for each measured variable signal;

processing each measured variable signal function with a criterial function to produce an optimal lag value for each measured variable signal;

processing each shifted matrix with a point calculation algorithm to produce a lag value for each column in each shifted matrix;

processing each lag value and each optimal lag value with lag estimator to output lag function for each lag; and

determine its goodness of fit for each lag function.